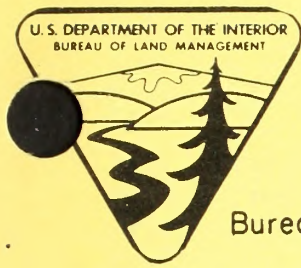


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# TECHNICAL NOTE

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Bureau of Land Management U.S. DEPARTMENT OF THE INTERIOR

Controlling Chaparral and Converting to Grass

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## Summary

A recommended procedure for controlling brush and converting to grass on Bureau lands in central California is:

Crush brush during spring or autumn with anchor chain; burn brush the following spring; seed grass in autumn with fertilizer by rangeland drill; aerial spray the first spring after seeding to kill brush seedlings and sprouts; properly manage area to maintain or increase desirable grasses.

## Results are:

Reduced soil erosion; increased carrying capacity for livestock and wildlife; reduced fire hazard; increased ground water supply; better accessibility for livestock management and recreation.

## Introduction

It has been estimated that some 4,000,000 ha (Sampson and Burcham, 1954) of California range covered with unpalatable brush can be converted to grass. There are about 120,000 ha on public lands in the Folsom District. Topography is moderate to very steep; elevations are between 300 and 1,600 m. Precipitation as rain and snow ranges from 25 to 100 cm, occurring during the winter from October to April. Soils are shallow to deep (25-50 cm), often low in fertility; they vary from sandy loam to heavy red clay. Brush species include chamise Adenostoma fasciculatum, buckbrush Ceanothus cuneatus, scrub oak Quercus dumosa, manzanita Arctostaphylos sp., toyon Heteromeles arbutifolia, and yerba santa Eriodictyon californicum.

In converting brush to grass in central California, the Bureau of Land Management (BLM) takes these steps: site selection, brush removal, seeding, spraying and management. Procedures and techniques practiced by the BLM are based to a great extent on results of research carried out by the California Division of Forestry, University of California, Forest Service, Agriculture Research Service and on BLM's own experience.

## Site Selection

In selecting the site, consideration is given to slope, precipitation, and soils. Slopes of more than 50% are too steep for use of equipment, and any disturbed soil may be subject to severe erosion.

In the Mediterranean type of climate, areas of precipitation of less than 40 cm are more easily revegetated to annual grasses than to perennials. Perennials or a combination of annuals and perennials are usually seeded on higher rainfall sites.

The most important consideration in selecting a site is type of soil. Data on soils are available from soil surveys of the Soil Conservation Service or soil-vegetation surveys completed by the California Division of Forestry and the University of California. Better sites are selected first, since chances of success and returns are greater. However, on brush or timbered areas burned by wildfire, immediate steps are taken to effect rehabilitation.

Brush conversion projects are carried on under cooperative agreements with the lessee (Burma, 1967). He assumes responsibility for the controlled burn. In this he receives help from his neighbors through the local Range Improvement Association.

## Brush Removal

Brush may be controlled by fire, machines, and chemicals; but more often by combining all three methods. Machines are manufactured which will cut, beat, disc, or plough the standing brush. Railing or crushing brush by dragging a log, rail, or anchor chain over the terrain is often used. Crushing the brush prior to burning is becoming a common practice because of the hazards involved in burning standing brush. Results are: better burns because fuel is concentrated on the ground; cleaner burns because most of the wood burns and no blackened stems are left standing; safer burns because dried brush can be burned during less hazardous weather. Late spring burning is preferable to autumn burning as it results in less sprouting.





PSC 932. Picture Galley Gulch Project

Certain areas are reserved to provide browse and cover for deer and other game. These areas of mature brush are improved by crushing or burning to produce sprouts and by developing water supplies. Economic studies made for the Folsom District, BLM, indicate that under present multiple use the best balance exists when 30% of the area remains in brush. (PSC 932)





PSC 1292 Towner Disc Plough

Offset disc ploughs weighing 3-5 m tons and 3-4 m wide will cut the brush and combine it into the soil eliminating the use of fire. In October 1968 the BLM in cooperation with the Towner Manufacturing Company and the California Division of Forestry demonstrated use of the offset disc plough in brush removal on 2 ha in Calaveras County. Half the area was disced once and the other half twice. The entire tract was broadcast-seeded to a mixture of grasses and legumes. Preliminary data indicate that a good stand of grasses and legumes can be obtained by discing and broadcast seeding. If a kill of 80-100% of brush is obtained, the necessity for aerial spraying can be eliminated.



## Seeding

Only autumn seeding, which takes advantage of winter rains, has been successful. Slopes less than 30% may be seeded by rangeland drill. Using a drill, fertilizer may be added at time of seeding resulting in better stands, especially of perennials. Slopes over 30% on which standing brush has been burned are seeded by aircraft. Mixtures of Harding grass Phalaris tuberosa, smilo Oryzopsis miliacea, Blando brome Bromus mollis, and Wimmera ryegrass Lolium rigidum are seeded at 6.7 kg/ha. Legumes including Rose clover Trifolium hirtum, sub clover Tribolium subterraneum and lana vetch Vicia dasycarpa have been added to the original seed mixture or drill seeded after the initial spraying. Harbinger medic Medicago littoralis, a close relative of California burr clover, has been well adapted through two years of testing on the Panoche Hills plots (Cornelius, 1967). It is a winter annual grown on dry rangeland in Australia. Both Harbinger medic and California burr clover Medicago hispida, originally from the Mediterranean region, mature seed in the spring before the dry, hot summer arrives. Harbinger medic will thrive in the Panoche Hills area but California burr clover will not persist. Seedings of Harbinger medic, for further field testing, were made in Panoche Hills and New Idria in the autumn of 1968.

## Spraying

Brush seedlings and sprouts are sprayed with herbicides, the spring after seeding. Approximately 1 kg of 2,4-D, 0.5 kg of 2,4,5-T <sup>1/</sup>, and 2 l of diesel fuel are mixed with water to make 20 l of solution (Leonard and Harvey, 1965). Commercial sources of 2,4-D and 2,4,5-T contain sufficient amounts of emulsifier for oil-water mixtures. This mixture is applied at 50 l/ha by helicopter. Clearance for use of herbicide spray material is obtained from the Federal Committee on Pest Control prior to application. This complies with state and federal regulations as to type of materials, quantities, and methods of application. It aids in precaution against damage to field crops in the area.

## Management

Newly-seeded areas of annuals can be grazed the first year if seed is allowed to mature. Perennial seedlings should not be grazed until seed maturity the second year. A system of grazing (rotation or rest-rotation) is planned which will maintain or improve the stand; it is made a part of the cooperative agreement prior to implementation of the project.

## Costs

Rehabilitation cost ranges from \$60 to \$120 per ha, varying with the method of conversion and other exigencies. Because of the increased production, the cost of converting brush to grass can usually be recovered in 5-10 years.

1/ On Prohibited List for Dept. of Interior - BLM use as of 1971.



## Results

Converting brush to grass reduces soil erosion. Under dense stands of chamise, the ground is quite bare. Heavy rains result in considerable soil erosion. In contrast, there is very little soil movement from a good grass cover.

A mature stand of chamise provides very little forage for livestock or wildlife. Brush fields which have been converted to grass have a carrying capacity of from 2 ha to 0.5 ha per animal unit month. Studies were made in 1963 by Carl M. Rice and Don Dimock (unpublished data), Range Rehabilitation Specialists, BLM, Sacramento, California, on the Bollinger Ridge Project, Santa Clara County, an annual rye-grass seeding following a wildfire. They indicated that 875 kg/ha of forage dry weight was available to livestock and/or big game. Studies made in 1964 on the Briceburg Project, Mariposa County, a perennial grass seeding following a wildfire, indicated 1,928 kg/ha of forage dry weight was available to livestock and/or big game (PSC 2199). The Picture Gallery Gulch Project, seeded to 2.2 kg each of Harding grass, smilgrass and Blando brome with 100 kg of 16-20-0 fertilizer per ha in 1964, produced up to 4,035 kg/ha from clipped plots the first year.



PSC 2199

During three years (1965-67) the density of seeded grasses has increased and native annual grasses and forbs have decreased. The density of Harding grass has increased from 13% in 1965 to 22% in 1967. Trials are needed for each soil type and climatic condition to demonstrate responses to various fertilizers.



Studies conducted by the University of California and the U.S. Forest Service indicate a considerable increase in yield of water from areas which have been converted from brush to grass. An increase of 6-15 cm has been measured on some experimental watersheds. Deep-rooted ever-green species of brush found in central California have a much higher rate of transpiration than grass.

Results of a cooperative investigation on the East Fork of Piney Creek, a tributary of Merced River in Mariposa, California, were recently reported (Burgy, 1968). Cooperators in this project included Merced Irrigation District, University of California at Davis, BLM, and private land owners. Data were collected on this watershed for 5 years before and for 5 years after treatment. Throughout the 10 years of study, annual precipitation varied from 41 cm to 107 cm, averaging 58 cm. Rainfall run-off increase follows a parabolic curve, showing that less than 30-38 cm of rainfall produce no increases in run-off after treatment. Years of average seasonal rainfall will produce 5-13 cm additional run-off after treatment. High years produced as much as 25-30 cm. Average increase at Piney Creek was 10-13 cm (low, 1.3 cm; high, 41.9 cm), all due to conversion of brush to grass.

Studies at Hopland Experimental Watershed II (Burgy, 1968) located in Mendocino County, California, are showing an average of over 10 cm additional run-off due to treatment, even during a period of rainfall-deficient years.

In preparing for a controlled burn, roads and trails are improved and additional fire breaks are constructed. This increases the speed and ease with which equipment can be moved into the area for control of wildfires. Conversion of brush to grass greatly reduces the amount of fuel and fires are more easily controlled.

Thick stands of brush are almost impenetrable to man and animal life. Conversion to grass makes it much easier to manage livestock. Hunters and recreationists can make greater use of the area.

Ecologically, the new grassland is moderately stable in the Sierra-Nevada foothills but less stable in Southern California. Stability depends on the soil, establishment of grass stand, initial control of brush, and grazing management. Projects which date back to 1951 and 1958 have not been reinvaded by brush.

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